

WHAT IS CLAIMED IS:

1. A road white line detecting apparatus, comprising:
a CCD camera to photograph a road surface;
5 an edge image generating section that generates an edge image from a road surface image photographed and outputted by the CCD camera;
a smear edge detecting section that detects edge positions of a smear from a region of the generated edge
10 image which is determined on the basis of a previously detected position of a white line on the road surface;
a smear edge eliminating section that eliminates smear edges corresponding to the edge positions of the smear from the generated edge image; and
15 a white line detecting section that detects the present position of the white line from the generated edge image from which the smear edges have been eliminated.
2. A road white line detecting apparatus as claimed
20 in claim 1, wherein the smear edge detecting section comprises: a smear edge candidate point detecting section that sets a smear edge candidate point detection region on a region of the generated edge image in which the
previously detected position of the white line is absent
25 to detect smear edge candidate points from the set smear edge candidate point detection region; and a smear edge verification section that sets a smear edge verification region which abuts the smear edge candidate point detection region and which is parallel translated from the smear edge
30 candidate point detection region in a reverse direction to a charge transfer direction of the CCD camera to verify the positions of the smear edges at which smear edge points are located within the set smear edge verification region

on the basis of coordinates of the detected smear edge candidate points.

3. A road white line detecting apparatus as claimed
 5 in claim 1, wherein the smear edge detecting section eliminates the smear edges from an internal of a white line search region into which the white line position detection section searches the present position of the white line when the detected positions of the smear edges by the smear
 10 edge detecting section is included in the white line search region.

4. A road white line detecting apparatus as claimed in
 claim 2, wherein the smear edge candidate point detecting
 15 section comprises: a first threshold value calculating section that calculates a first threshold value to determine the smear edge candidate points on the basis of extreme values on edge accumulated values and average values thereon in the charge transfer direction of the CCD camera within
 20 the smear candidate point detection region; and a coordinate detecting section that detects coordinates of the extreme values of the edge accumulated values and the edge accumulated values at the extreme values which are equal to or larger than the first threshold value, the detected
 25 coordinates thereof being coordinates of the smear edge candidate points, and wherein the smear edge verification section comprises: a second threshold value calculating section that calculates second threshold values to determine the smear edge respectively corresponding to the
 30 edge accumulated values of the smear edge candidate points; and a smear edge position detecting section that detects the positions of the smear edges from the coordinates of the edge accumulated values with respect to the smear edge

verification region which are equal to or larger than their corresponding second threshold values.

5. A road white line detecting method, comprising:
 - 5 providing a CCD camera to photograph a road surface;
 - generating an edge image from a road surface image photographed and outputted by the CCD camera;
 - 10 detecting edge positions of a smear from a region of the generated edge image which is determined on the basis of a previously detected position of a white line on the road surface;
 - eliminating smear edges corresponding to the edge positions of the smear from the generated edge image; and
 - 15 detecting the present position of the white line from the generated edge image from which the smear edges have been eliminated.
6. A road white line detecting method as claimed in
 - 20 claim 5, wherein, when detecting the edge positions of the smear, setting a smear edge candidate point detection region on a region of the generated edge image in which the previously detected position of the white line is absent to detect smear edge candidate points from the set smear
 - 25 edge candidate point detection region and setting a smear edge verification region which abuts the smear edge candidate point detection region and which is parallel translated from the smear edge candidate point detection region in a reverse direction to a charge transfer direction
 - 30 of the CCD camera to verify the positions of the smear edges at which smear edge points are located within the set smear edge verification region on the basis of coordinates of the detected smear edge candidate points.

7. A road white line detecting method as claimed in claim 5, wherein, when eliminating the smear edges from the generated edge image, eliminating the smear edges from an internal of a white line search region into which the present position of the white line is searched when the detected positions of the smear edges is included in the white line search region.

8. A road white line detecting method as claimed in claim 6, wherein, when detecting the smear edge candidate points, calculating a first threshold value to determine the smear edge candidate points on the basis of extreme values on edge accumulated values and average values thereon in the charge transfer direction of the CCD camera within the smear candidate point detection region and detecting coordinates of the extreme values of the edge accumulated values and the edge accumulated values at the extreme values which are in excess of the first threshold value, the detected coordinates thereof being coordinates of the smear edge candidate points, and wherein, when setting the smear edge verification region, calculating second threshold values to determine the smear edge respectively corresponding to the edge accumulated values of the smear edge candidate points and detecting the positions of the smear edges from the coordinates of the edge accumulated values with respect to the smear edge verification region which are in excess of their corresponding second threshold values.

9. A road white line detecting method as claimed in claim 8, wherein the CCD camera is disposed to photograph the road surface in a vehicular forward direction, wherein the smear edge candidate point detection region is a rectangular

region having four vertexes of PLH ($LX_n + X_{off}$, SY_n), PRH ($RX_n - X_{off}$, $SY_n + DY$), PLL ($LX_n + X_{off}$, $SY_n + DY$), and PRL($RX_n + X_{off}$, $SY_n + DY$), wherein X_{off} denotes an X-axis directional offset value from a lowest point of left and right previously detected white line positions expressed as SL_n (SLX_n , SY_n) and SR_n (SRX_n , SY_n) and DY denotes a movement distance in a Y-axis negative direction from the two vertexes of PLH and PRH, denotes the number of white line search regions, X-axis positive direction being vertical to a Y-axis positive direction which is coincident with the charge transfer direction of the CCD camera, and the smear edge candidate point verification region has four vertexes of PLH ($LX_n + X_{off}$, SY_n), PRH ($RX_n - X_{off}$, SY_n), PLM ($LX_n + X_{off}$, $SY_n - DY$), and PRM ($RX_n + X_{off}$, $SY_n - DY$), wherein the edge accumulated values are derived for respective X-axis positive coordinate values within the smear edge candidate point detection region, a positive maximum value (V_{pmax}), a negative minimum value (V_{mmin}), a positive average value (A_p), and a negative average value (A_m) for the respective edge accumulated values are derived, first threshold values ($TA1$ and $TA2$) for the positive and negative accumulated values are calculated as follows: $TA1 = \alpha * (V_{mmax} + A_p)$ and $TA2 = \alpha * (V_{mmin} + A_m)$, wherein α denotes a first predetermined value for the respective first threshold values $TA1$ and $TA2$ to be interposed between a road surface edge intensity and a smear edge intensity, and the X-axis coordinate values (AX_i) of positive extreme values of the edge accumulated values which are equal to or positively larger than the positive first threshold value ($TA1$) and those of the negative extreme values of the edge accumulated values (AX_i) which are equal to or negatively larger than the negative first threshold value ($TA2$) are derived and the accumulated values (AV_i) corresponding to

- the extreme values which are equal to or positively or negatively larger than the positive or negative first threshold value (TA1 or TA2) are derived, wherein the second threshold value (TBi) corresponding to the individual edge
- 5 accumulated values are calculated in the smear edge verification region as follows: $TBi = \beta * AVi$, wherein β denotes a second predetermined value based on a statistical value of a ratio between the edge accumulated values in the smear edge candidate point detection region
- 10 and those in the smear edge verification region, and wherein the accumulated value (Bi) in the Y-axis positive direction is derived for the X-axis positive coordinate values (AXi) of the smear edge candidate points within the smear edge verification region and when any accumulated values (Bi)
- 15 are equal to or larger than the second threshold value (TBi), the corresponding X-axis coordinate values (AXi) are detected as the coordinate values of the smear edge positions.
- 20 10. A road white line detecting method as claimed in claim 9, wherein when the X-axis coordinates (AXi) of the detected smear edge is present within one of the white line search regions (40), a value of " 0 " is written into a part of the white search region (40) which has diagonal vertexes
- 25 expressed as $(AXi - DX, SY_{k-1})$ and $(AXi + DX, SY_k)$, wherein k denotes an order number of the white line search regions and Y-axis coordinate values of the k-th number of the white line search regions are expressed as SY_{k-1} and SY_k .
- 30 11. A road white line detecting apparatus, comprising:
 photographing means having a CCD camera to photograph a road surface;
 edge image generating means for generating an edge

image from a road surface image photographed and outputted by the CCD camera;

smear edge detecting means for detecting edge positions of a smear from a region of the generated edge image which is determined on the basis of a previously
5 detected position of a white line on the road surface;

smear edge eliminating means for eliminating smear edges corresponding to the edge positions of the smear from the generated edge image; and

10 white line detecting means for detecting the present position of the white line from the generated edge image from which the smear edges have been eliminated.

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